# DISTRIBUTED PROCESSING NETWORK SIMULATOR (DPNS)

## Version 2.0 Preliminary User Documentation

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# Chapter 1

# Introduction

The version of DPNS Version 2 which is described in this document consists of two programs, the DPNS model and the report generator (sometimes referred to as the 'backend'). The DPNS Version 2 user interface, which is currently not available, is the third progam in the package. It provides the user with an interactive tool for defining and validating model attributes and generating the appropriate input data files needed by the model. It is possible to use the model and report generator without the interface. This document serves as a guide for using DPNS without the interface.

The model obtains user defined system attributes from various data files, simulates the system defined, and automatically generates a set of statistical reports. These reports are created by constructs that are intrinsic to ECSS; therefore, the reports are very general and do not reflect the user defined attributes. The report generator program is used to clean up and reformat these original reports.

Most of the DPNS model was written in the ECSS language, while the report generator was implemented only in SIMSCRIPT. Both programs, however, were developed under the ECSS environment.

# Chapter 2

# DPNS Version 2.0 Runtime Environment

The DPNS account is supplied with all the necessary files to run the model and report generator. Although these programs were developed with ECSS programming tools, ECSS is not required for execution of the programs.

## 2.1 DPNS account files

The following is a list of the files in the DPNS account and a brief description of each file. The input data files are further described later on in this document.

- Simcontrol.Dat - Input data file needed by the model and report generator. Contains the simulation control attributes.
- Systemdefn.Dat - Input data file needed by the model and report generator. Contains the system definition attributes.
- SSPayload.Dat - Input data file needed by the model and report generator. Contains the attributes for the workload.
- DPNS2.exe - The DPNS Version 2.0 model executable file.

- DPNS2.evt - The DPNS Version 2.0 model external event file. This is an ECSS requirement for execution of the model.
- Simassign.Com - Command file for assigning the input data files to VMS logical I/O units. This file must be activated just before execution of the model and report generator.
- DPNS28.Dat - Internal data file required by the DPNS Version 2.0 model. This file must not be damaged or rewritten.
- Backend2.exe - The DPNS Version 2.0 report generator executable file.
- Backend2.evt - The DPNS Version 2.0 report generator external event file. This is an ECSS requirement for execution of the report generator.
- Backend28.Dat - Internal data file required by the report generator. This file is not to be destroyed.
- EcssRun.Com - ECSS supplied command file invoked for DPNS execution.

## 2.2 DPNS Version 2.0 account requirements

DPNS requires that a certain amount of virtual memory and storage space be allocated to the account where it resides. The model can use a large amount of dynamic memory and the files generated by DPNS can be large. The figures below are safe estimates of the what the account characteristics should be.

- Virtual Memory Page Allocation: approx. 30,000 pages
- Account Storage Blocks: approx. 3,500 blocks or more

# Chapter 3

# DPNS Version 2.0 Data Files

As previously mentioned, the DPNS input files are typically generated through the user interface, but because these files are simple text files then it is possible to manipulate them with a text editor. Editing the files is tedious and could increase the risk of invalid data. The model is not equipped to handle any errors, since that is the responsibility of the user interface. Therefore, if errors should occur during the execution of the model, the input data files should be checked immediately.

The sections in this chapter outline the formats of the input files, define validation checking to be made, and list the default data values. These file specifications were created as programmer guides for implementing the user interface. Therefore, the specifications are written primarily in pseudo code, and in most cases, a reference to the data entry menu is given with the data field. The DPNS account contains examples of the input data files, thus making it easier for a user to manipulate the files without having to create them from scratch.

## 3.1 SimControl file format

File Name: 'simcontrol.dat'

This chart describes the data fields of the simcontrol file. The raw data file should not deviate from this format. For clarity in this document, data items have been preceded by a '-'. The dash, '-', should not be included in the acutal data file. Data validation rules are described in another section.

DATA FIELDS

==========

- Simulation Time
- Random Number Stream

## 3.2 SystemDefn.Dat file format

File Name: 'systemdefn.dat'

This data file contains the attributes of the physical system to be modeled. The following outline specifies the format of the file's data items (preceded by a '-' for clarity in the document) and the user interface menu where the data is obtained. Data validation rules are descibed in another section. If the user interface is not being used for data entry, then the menu references can be ignored.

The data in the file must be in the order specified. Real numbers without a fractional part can be written as integers, as they are automatically converted within the model. Text data must be in upper case.

| DATA ITEM | USER INTERFACE MENU |
|---|---|
| - Total Number of LANs | Network Wide Topology |
| For every LAN 'x' | |
| - No. Of Nodes Per LAN 'x' | Local Network Topology |
| IF Total No. LANs in system > 1 | |
| THEN | |
| For every LAN in the system other than LAN 'x' | |
| - Final Destination LAN | |
| - Intranet gateway node number | |
| - Directly connected LAN | |
| ELSE | |
| Don't write out anything to file. | |

| DATA ITEM | USER INTERFACE MENU |
|---|---|
| For every LAN<br>- Frame Header Size<br>- Frame Data Size<br>- Datalink Protocol | Local Network Protocols |
| For every LAN<br>- Default Bus Transmission Rate<br>- User Bus Transmission Rate | Local Network Protocols |
| IF Total No. LANs in system > 1<br>THEN<br>- Total Number of Internetwork Links<br>ELSE<br>Don't write anything to the file. | Network Wide Topology |
| IF Total No. LANs in system > 1<br>THEN<br>For every Internetwork Link<br>- First Connected LAN<br>- Second Connected LAN<br>- Default Data rate on Link<br>- User Data rate on Link<br>ELSE<br>Don't write anything to the file. | Network Wide Topology |

| DATA ITEM | USER INTERFACE MENU |
|---|---|
| - Total number of SDP (system data processing) nodes in the Wide Area Network. Note: these nodes cannot be defined as gateways. | Node Characteristics |
| For 1 to Total.Number.Of.SDP.Nodes | |
| - LAN where SDP node resides | Node Characteristics |
| - SDP Node (station) number | Node Characteristics |
| FOR 1 to Total No. Device Types (where the total is currently 10) | |
| - Device Type | Node Characteristics |
| - Quantity of the device specified for the node | Node Characteristics |
| - Default Transmission/ Execution Rate | Node Characteristics |
| - User Transmission/ Execution Rate | Node Characteristics |
| - Latency | Node Characteristics |
| - Total number of database packages in the system | Node Characteristics |

| DATA ITEM | USER INTERFACE MENU |
|---|---|
| For every database package | |
| - LAN ID of DB | Node Characteristics |
| - Node ID of DB | Node Characteristics |
| - Database ID | Node Characteristics |
| - Database type | Node Characteristics |
| - Number of transactions/sec | Node Characteristics |
| - Acknowledgment size | Node Characteristics |
| - Summation of all logical devices for all workload jobs and subjobs. | Logical Resource Mapping |
| For i to Total.No.Of.Logical.Devices | |
| - LAN Id of logical device | Logical Resource Mapping |
| - Node Id of logical device | Logical Resource Mapping |
| - Device Name | Logical Resource Mapping |
| - Device Type | Logical Resource Mapping |
| - Summation of all Logical Databases defined for the workload | Database Mapping |

| DATA ITEM | USER INTERFACE MENU |
|---|---|
| For 1 to Total.No.Of.Logical DBs | |
| - LAN Id of database | Database Mapping |
| - Node Id of database | Database Mapping |
| - Database Name | Database Mapping |
| - Database ID | Database Mapping |
| - Storage Device Type | Database Mapping |
| - Storage Device Name | Database Mapping |
| - Acknowledgment Data Size | SDP Characteristics |
| - Summation of all jobs and subjobs in the workload. | Job Placement On Network |
| For 1 to Total.No.Jobs.and.Subjobs | |
| - Network ID being mapped to. | Job Placement On Network |
| - Node ID being mapped to. | Job Placement On Network |
| - Main Job Name (i.e., SS.PAYLOAD) | Job Placement On Network |
| - Name of mapped job/subjob. (This job may be the same as the Main Job, i.e., if SS.PAYLOAD is being mapped.) | Job Placement On Network |

## 3.3 SSPayload.Dat file format

File Name: 'sspayload.dat'

The following outline represents the data file format for the workload job SS Payload and its subjobs. This data is used for both the foreground and background jobs. The background jobs' CPU instructions and I/O data sizes are scaled up or down from the respective foreground jobs. For example if a foreground job executes 100 CPU instructions and the background to foreground scale is 2.0, the respective background job will execute 200 instructions. The scale is multiplied by all background jobs' attributes.

Default values are listed for all job values. Most of the default values were extracted from the TRW specification of the job SSPayload. Whenever a default value was not specified in the TRW reference, the attribute was given a value of '0'.

```
The general format for each job/subjob is:
                    - Name of Job/Subjob
                    - No. Instructions
                    - Inputs (if exist)
                        - Name of Input
                        - Source
                        - Size
                    - Outputs (if exist)
                        - Name of Output
                        - Destination
                        - Size

Note, all data items are preceded by a '-'.
```

FILE FORMAT

---

- SSpayload Start Time in Seconds (Real Variable >= 0.0)
- Background Job Inclusion Response ('Y' or 'N')
- Background Payload Start Time in Seconds (Real Value >= 0.0)
- Background 'Scale' to foreground (Real Value >= 0.0)

IF Job Inclusion Response = 'N'

THEN

Background Payload Start Time = 0.0

Background Scale = 0.0

Job Name:

- 'SS.PAYLOAD'
- No. Instructions (Default = 0)

Subjobs for SS.Payload:

Subjob:

- 'CONTROL.UTILITIES'
- No. Instructions (Default = 40000)

Inputs:

- 'SS.PAYLOAD.UTILITIES.STATUS'
- 'SS.PAYLOAD.UTILITIES.SENSORS'
- Input.Size (Default = 1700)

- 'TIME'
- 'REAL.TIME.CLOCK'
- Input.Size (Default = 8)

- 'SS.PAYLOAD.UTIL.DIRECTIVES'
- 'SSDS'
- Input.Size (Default = 1700)

- 'SS.PAYLOAD.UTIL.DIRECTIVES'
- 'CUSTOMER.MMI'
- Input.Size (Default = 1700)

Outputs:

- 'SS.PAYLOAD.UTILS.CMDS'
- 'DISPLAY'
- Output.Size (Default = 1700)

- 'SS.PAYLOAD.UTILS.CMDS'
- 'RECORDER'
- Output.Size (Default = 1700)

- 'SS.PAYLOAD.UTILS.CMDS'
- 'SSDS.DB1'
- Output.Size (Default = 1700)

Subjob:

- 'INITIALIZE'
- No. Instructions (Default = 1000)

Inputs:

- 'SS.PAYLOAD.INIT.DIR'
- 'SSDS.DB1'

- Input.Size (Default = 16000)

- 'SS.PAYLOAD.INIT.DIR'
- 'CUSTOMER.TAPE'
- Input.Size (Default = 16000)

- 'SS.PAYLOAD.INIT.DIR'
- 'CUSTOMER.MMI'
- Input.Size (Default = 16000)

Outputs:

- 'SS.INIT.STATUS'
- 'SSDS.DB2'
- Output.Size (Default = 16000)

- 'SS.INIT.STATUS'
- 'CUSTOMER.MMI'
- Output.Size (Default = 16000)

- 'SS.PAYLOAD.INIT.CMDS'
- 'SS.PAYLOAD'
- Output.Size (Default = 16000)

Subjob:

- 'CHECKOUT'
- No. Instructions (Default = 1000000)

Inputs:

- 'PAYLOAD.I.T.DIR'
- 'SSDS.DB1'
- Input.Size (Default = 500000)

- 'PAYLOAD.I.T.DIR'
- 'CUSTOMER.MMI'
- Input.Size (Default = 500000)

- 'PAYLOAD.I.T.STATUS'
- 'PAYLOAD.TEST.UNIT'
- Input.Size (Default = 5000000)

- 'TIME'
- 'REAL.TIME.CLOCK'
- Input.Size (Default = 8)

Outputs:

- 'PAYLOAD.I.T.CMDS'
- 'PAYLOAD.TEST.UNIT'
- Output.Size (Default = 500000)

- 'PAYLOAD.I.T.STATUS'
- 'SSDS.DB2'
- Output.Size (Default = 500000)

- 'PAYLOAD.I.T.STATUS'
- 'CUSTOMER.MMI'
- Output.Size (Default = 500000)

Subjob:

- 'OPERATE'
- No. Instructions (Default = 0)

Subjob:

- 'POINT'
- No. Instructions (Default = 20000)

Inputs:

- 'SS.PAYLOAD.ATTITUDE'
- 'SSDS.DB1'
- Input.Size (Default = 5000)

- 'SS.PAYLOAD.STATE.VECTOR'
- 'SSDS.DB2'
- Input.Size (Default = 5000)

- 'TIME'
- 'REAL.TIME.CLOCK'
- Input.Size (Default = 8)

Outputs:

- 'SS.PAYLOAD.POINT.CMDS'
- 'SS.PAYLOAD.PLATFORM'
- Output.Size (Default = 3333)

- 'SS.PAYLOAD.POINT.STATUS'

- 'SSDS.DB1'
- Output.Size (Default = 3333)

- 'SS.PAYLOAD.POINT.STATUS'
- 'DISPLAY'
- Output.Size (Default = 3333)

Subjob:

- 'MAINTAIN'
- No. Instructions (Default = 60000)

Inputs:

- 'PAYLOAD.MONITORING.STATUS'
- 'PAYLOAD.MONITORING.SENSORS'
- Input.Size (Default = 1700)

- 'PAYLOAD.CHECKOUT.DIR'
- 'SSDS.DB2'
- Input.Size (Default = 1700)

- 'PAYLOAD.CHECKOUT.DIR'
- 'CUSTOMER.MMI'
- Input.Size (Default = 1700)

- 'TIME'
- 'REAL.TIME.CLOCK'
- Input.Size (Default = 8)

Outputs:

- 'PAYLOAD.MAINT.CMDS'
- 'PAYLOAD.CHECK.UNIT'
- Output.Size (Default = 1700)

- 'PAYLOAD.MAINT.STATUS'
- 'SSDS.DB1'
- Output.Size (Default = 1700)

- 'PAYLOAD.MAINT.STATUS'
- 'CUSTOMER.MMI'
- Output.Size (Default = 1700)

Subjob:

- 'ROTATE.SS.PORT'
- No. Instructions (Default = 3000)

Inputs:

- 'SS.PAYLOAD.ATTITUDE.STATUS'
- 'SENSORS'
- Input.Size (Default = 3333)

- 'TIME'
- 'REAL.TIME.CLOCK'
- Input.Size (Default = 8)

- 'ROTATE.SS.PORT.DIR'
- 'SSDS'

- Input.Size (Default = 3333)

- 'ROTATE.SS.PORT.DIR'
- 'CUSTOMER.MMI'
- Input.Size (Default = 3333)

Outputs:

- 'ROTATE.SS.PORT.CMDS'
- 'SS.PORT.ROT.UNIT'
- Output.Size (Default = 3333)

- 'SS.PAYLOAD.POINT.STATUS'
- 'DISPLAY'
- Output.Size (Default = 3333)

- 'SS.PAYLOAD.POINT.STATUS'
- 'SSDS.DB2'
- Output.Size (Default = 3333)

Subjob:

- 'USE.UTILITIES'
- No. Instructions (Default = 0)

Subjob:

- 'PERFORM.EXPERIMENT'
- No. Instructions (Default = 0)

## 3.4 Processing and error checking

The chart below specifies the field processing and validation checks for all three input data files. Since this specification was originally intended to be used as a guide for user interface development, references to the various interface menus are included. Furthermore, the data is ordered with respect to the menus and not the files. To make things a bit easier for the reader, references to the respective data files have been included.

Note: Data items are preceded by a '-'. Real values that do not have a fractional part can be entered as integers, since the model will automatically convert them. All text data must be entered in upper case, since no conversion is done in the model.

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| Simulation Control Specifications Menu | - Simulation Time | Real Value in Seconds |
| (Simcontrol.Dat) | - Random No. Stream | 0 < Integer <= 10 |
| Network Wide Topology Menu | - Total No. LANs | 1 <= No. LANs <= 5 |
| (SystemDefn.Dat) | Direct LAN Connections - LAN to - LAN | 1) A LAN cannot connect with itself. 2) Connections are bidirectional, i.e, (LAN 1 to LAN 2) = (LAN 2 to LAN 1). |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | - Data Rate | IF Total.No.LANs > 1<br>THEN<br>1 <= Rate <= Integer<br>ELSE<br>Rate = 0 |
| | - Total Number of connections (Internet Links) | Summation of all Network Links. Equals 0 if Total.No.LANs = 1. |
| Local Network Topology<br>(SystemDefn.Dat) | - LAN ID | 1 <= LAN ID <= Total.No.LANs |
| | - Number Of Nodes | 1 <= No.Nodes <= 50 (Where the total number nodes in system < = 50) |
| | - Final Dst LAN | IF Total.No.LANs = 1<br>THEN<br>Dst LAN = 0<br>ELSE<br>1 <= Dst LAN <= Total.No.LANs<br>AND Dst LAN <> LAN ID |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | - Intranetwork Bridge or gateway node | IF Total.No.LANs = 1<br>THEN<br>Gate/Bridge = 0<br>ELSE<br>1 <= Gate/Bridge <= No.Nodes on this LAN<br>(Node cannot also be defined as an SDP) |
| | - Next LAN on Route | 1) This menu's LAN ID must be directly connected to the current LAN defining.<br>2) Only one gateway can connect one or more to one or more LANs, i.e., both Node 1 and 2 on LAN 1 cannot connect to LAN 2, but Node 1 can connect LAN 1 to LANs 2 and 3.<br>3) No connections can exist if No.LANs = 1. |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | - Total.No.SDP.Nodes (system data processing) | Summation of all nodes in the system that are not gateways or bridges. |
| Local Network Protocols Menu (SystemDefn.Dat) | - LAN ID | 1 <= LAN ID <= Total.No.LANs |
| | - Datalink Layer | Any text variable. If Dlink layers of two connected LANs are not equal, then their connection is via gateways (message formats are converted according to the Receiving LAN's transport protocol), otherwise, their connections are via bridges and no message conversion is done. |
| | - Physical Layer | Any text value. This attribute is currently ignored by the model. |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | - Frame Header Size (Transport layer) | 0 < Size <= Integer AND Header Size defined for other LANs with the same Dlink protocol must be the same. |
| | - Frame Data Size (Transport layer) | 0 < Size <= Integer AND Data Size defined for other LANs with the same Dlink protocol must be the same. |
| | - Bus Trans Rate | 0 < Rate <= Integer |
| Node Characteristics (SystemDefn.Dat) | - LAN ID | 1 <= LAN ID <= Total.No.LANs |
| | - Node ID | 1 <= Node ID <= No.Nodes on LAN ID AND Node ID cannot be a bridge or gateway node. |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | - Device Type | Do not modify |
| | - Quantity | 0 <= (Quantity + total no. devices of same type in system) <= 80 |
| | - Latency | Any Real Variable. 'PROCESSOR' latency = 0 |
| | - Transmit/Exec Rate | 0 <= Rate <= Integer |
| | - Total.No.Database packages | All databases defined on Node 1 + ... + All databases defined on last Node |
| | Database ID | 1) Any word up to 10 chars; cannot have more than one of the same DB package on a node. 2) There must be a storage device and 1 or more PROCESSORs on node. |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | Database Type | 'NONDISTRIBUTED', i.e., the database can only reference local storage devices. |
| | Transactions/sec | Any integer > 0. |
| | Acknowledgement Size | 0 <= Size (bytes) <= Integer |
| Background Job Specifications (SSPayload.Dat) | - Background Job | 'BG.PAYLOAD' |
| | - Run Background Job? | 'Y' or 'N' response |
| | - Job Mean Inter-arrival time | Real value >= 0.0 |
| | - Background scale | Real value >= 0.0 |
| Job Specifications (SSPayload.Dat) | - Job Name | do not modify |
| | - Job Start Time | Real value >= 0.0 |
| | - Instructions Exec | 0 <= No.Instrs <= Integer |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| Subjob Specification | - Job Name | Do not modify |
| (SSPayload.Dat) | - Subjob Name | Must be a subjob of 'SS.PAYLOAD' |
| | - Instrs Executed | 0 <= No.Instrs <= Integer |
| | - Input/Output Names | Do not modify |
| | - I/O Source,Destn | Do not modify |
| | - I/O Size | 0 <= Size (bytes) <= Integer (I/O is not accepted for subjobs: 'OPERATE', 'USE.UTILITIES', 'PERFORM.EXPERIMENT' |
| Logical Resource Mapping (SystemDefn.Dat) | - Resource Name | Do not modify. Taken directly from workload. |
| | - Resource Physical Device Type | Do not modify. |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | - LAN ID of resource | 1 <= LAN ID <= Total.No.LANs |
| | - Node ID of resource | 1 <= Node ID <= No.Nodes on LAN ID AND Number of Resource phys devices on Node > 0 AND Node must be an SDP |
| Database Mapping (SystemDefn.Dat) | - Logical Database Name | Do not modify. Extracted directly from workload. |
| | - Database ID | Must match a Database Package ID configured on an SDP node. |
| | - LAN ID of database | 1 <= LAN ID <= Total.No.LANs (must be a LAN with the same Database ID) |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| | - Node ID of database | 1 <= Node ID <= No.nodes on LAN ID AND (Node ID has the same Database ID.) |
| | - Storage Device Physical Type | DISK or TAPE DRIVE AND Node ID has 1 or more of that storage device. |
| | - Logical Storage Device Name | Must be a predefined logical storage device of of the above type. AND Storage Device must reside on the same node as the Database. |
| | - Total.No.Logical Databases | Summation of all logical databases defined for the workload. |

| MENU/FILE | FIELD | PROCESSING/VALIDATION |
|---|---|---|
| Job Placement On Network (SystemDefn.Dat) | - Job/Subjob Name | Do not modify. |
| | - LAN ID of job | 1 <= LAN ID <= Total.No.LANs |
| | - Node ID of job | 1 <= Node ID <= No.nodes on LAN ID AND Node ID has 1 or more PROCESSORs AND Node must be an SDP |
| | - Total.No.Jobs | Summation of all Jobs and Subjobs in the workload. |

## 3.5 Default values

The default values specified, characterize a system with one LAN having one node. All devices and workload jobs are mapped to this LAN,Node pair. Default values specified for resources, i.e., device rates, number of database transactions, were extracted from various sources, including TRW and McDonnell Douglas SSIS Studies.

This specification was originally intended to be used as a guide for user interface development; therefore, references to the various interface menus are included. Furthermore, the data is ordered with respect to the menus and not the files. To make things a bit easier for the reader, references to the respective data files have been included.

Default values for the workload attributes are specified above in the SSPayload.Dat file format section.

| MENU/FILE | FIELD | DEFAULT VALUE |
|---|---|---|
| Simulation Control Specifications (Simcontrol.Dat) | Simulation Time | 1000 seconds |
| | Random No. Stream | 1 |
| Network Topology (SystemDefn.Dat) | Number of LANs | 1 |
| | LAN Connections | blank |

| MENU/FILE | FIELD | DEFAULT VALUE |
|---|---|---|
| Local Network Topology (SystemDefn.Dat) | LAN ID | 1 |
| | Number of nodes | 1 |
| | Internetwork Routes | blank |
| Local Network Protocols (SystemDefn.Dat) | LAN ID | 1 |
| | ALL Layer Fields (except physical and datalink) | NONE |
| | Frame Header Size | 8 (bytes) |
| | Frame Data Size | 1024 (bytes) |
| | Datalink Layer | TTR |
| | Physical Layer | FDDI |
| | Bus Transmission Rate | 100000000 (bits/sec) |

| MENU/FILE | FIELD | DEFAULT VALUE | |
|---|---|---|---|
| Node Characteristics (SystemDefn.Dat) | LAN ID | 1 | |
| | Node ID | 1 (or current node) | |
| | Device Type | Transmit/Exec Rate | Latency (secs) |
| | TAPE.DRIVE | 2000000 Bytes/Sec | 0.0 |
| | DISK.DRIVE | 4000000 Bytes/Sec | 0.0 |
| | PROCESSOR | 2000000 Instrs/Sec | N/A |
| | DISPLAY | 19000 Bits/Sec | 0.0 |
| | INSTRUMENT | 2000000 Bits/Sec | 0.0 |
| | CLOCK | 100 Bits/Sec | 0.0 |
| | SENSOR | 5000 Bits/Sec | 0.0 |
| | VOICE | 16000 Bits/Sec | 0.0 |
| | VIDEO | 22000000 Bits/Sec | 0.0 |
| | PRINTER | 100 Bytes/Sec | 0.0 |
| | Quantity (of every device) | 1 | |

| MENU/FILE | FIELD | DEFAULT VALUE |
|---|---|---|
| | Database ID | INGRES |
| | Database Type | NONDISTRIBUTED |
| | No. Transactions/Sec | 60 |
| | Acknowledgement Size | 4 (bytes) |
| Background Job Specifications (SSPayload.Dat) | Background Job | BG.PAYLOAD |
| | Run background job? | N |
| | Mean Interarrival Time | 0.0 |
| | Background Scale | 0.0 |
| Job Specifications (SSPayload.Dat) | Job Name | SS.PAYLOAD |
| | Job Start Time | 0.0 |
| | Instructions Exec | 0 |
| | I/O fields | 0 |

| MENU/FILE | FIELD | DEFAULT VALUE |
|---|---|---|
| Logical Resource Mapping | Job Using Resources | SS.PAYLOAD |
| | Logical Resource Name | Phys Device Type |
| (SystemDefn.Dat) | SS.PAYLOAD.UTILITIES.SENSORS | SENSOR |
| | REAL.TIME.CLOCK | CLOCK |
| | SSDS | INSTRUMENT |
| | CUSTOMER.MMI | DISPLAY |
| | DISPLAY | DISPLAY |
| | RECORDER | VOICE |
| | CUSTOMER.TAPE | TAPE.DRIVE |
| | SS.PAYLOAD | INSTRUMENT |
| | PAYLOAD.TEST.UNIT | INSTRUMENT |
| | SS.PAYLOAD.PLATFORM | INSTRUMENT |
| | PAYLOAD.MONITORING.SENSORS | SENSOR |
| | PAYLOAD.CHECK.UNIT | INSTRUMENT |
| | SENSORS | SENSOR |
| | SS.PORT.ROT.UNIT | INSTRUMENT |
| | TAPE.DRIVE1 | TAPE.DRIVE |
| | TAPE.DRIVE2 | TAPE.DRIVE |
| | TAPE.DRIVE3 | TAPE.DRIVE |
| | TAPE.DRIVE4 | TAPE.DRIVE |

| MENU/FILE | FIELD | DEFAULT VALUE |
|---|---|---|
| | DISK.DRIVE1 | DISK.DRIVE |
| | DISK.DRIVE2 | DISK.DRIVE |
| | DISK.DRIVE3 | DISK.DRIVE |
| | DISK.DRIVE4 | DISK.DRIVE |
| | LAN Id | 1 (for all devices) |
| | Node Id | 1 (for all devices) |
| Database Mapping (SystemDefn.Dat) | Database name | SSDS.DB1 |
| | | SSDS.DB2 |
| | Database ID | INGRES |
| | LAN ID | 1 (for both DBs) |
| | Node ID | 1 (for both DBs) |
| | Storage Type | DISK.DRIVE (both DBs) |
| | Storage Name | DISK.DRIVE1 (both DBs) |

| MENU/FILE | FIELD | DEFAULT VALUE |
|---|---|---|
| Job Placement On Network (SystemDefn.Dat) | Job Name | SS.PAYLOAD |
| | Job LAN | 1 |
| | Job Node | 1 |
| | Subjob Name | existing SS Payload Subjobs |
| | Subjob LAN | 1 (for all subjobs) |
| | Subjob Node | 1 (for all subjobs) |

# Chapter 4

# Executing DPNS Version 2.0

After the input data files are manipulated and validated by the user, DPNS is ready to execute. Since both the model and report generator were developed in an ECSS environment, running them is similar. If an error should occur at runtime, a built in trace mechanism is automatically activated. Often times the error is caused by a faulty input file. Check all the input files and try running the program again.

The following sections describe step by step how to execute both the model and report generator. Steps on how to terminate a successful run and a nonsuccessful run are given.

Note: it may be easier and quicker to create a VMS command file to automatically perform some of the steps listed below.

## 4.1 Executing DPNS Version 2.0 Model

The model requires the following input files: 'Simcontrol.Dat', 'SystemDefn.Dat', and 'SSPayload.Dat'.

Note: every command entered at the terminal is terminated with a carriage return.

1. At the VMS command level, enter: '@simassign'. This will assign the input data files to their logical units.

2. At the VMS command level, enter: '@ecssrun dpns2'. This will initiate the execution of the model. The model could take some time, depending on the system being simulated.

3. If the model terminates normally, enter: 'save' after the 'TYPE, PRINT, SAVE unit 6 output ?: ' prompt. This will save the model's generated output report to the file called 'DPNS26.LIS'. This file will be used by the DPNS report generator.

4. If the model terminates with an error, then the SIMSCRIPT trace is activated. Exit the trace and program in the following way: at every trace prompt, enter a 'N'. On ocassion, the 'TYPE, PRINT, SAVE unit 6 output ?: ' prompt will appear after exiting the trace. Enter a 'save'.

## 4.2 Executing DPNS Version 2.0 Report Generator

The reports created by the report generator are output to the file: 'Report.Lis'. Reports are not output to the screen. The report generator requires the following input files: 'DPNS26.Lis', 'Simcontrol.Dat', 'Systemdefn.Dat', and 'SSPayload.Dat'.

Note: the report generator should be executed after a successful run of the model. Because the report generator relies on the user interface to screen out errors, its error handling capabilities are minimal. Therefore, the input data files and the DPNS26.LIS file should be valid.

1. At the VMS command level, enter: '@simassign'. This will assign the input data files to their logical units.

2. At the VMS command level, enter: '@ecssrun backend2'. This will initiate the execution of the report generator. The model input is first formatted and written to the 'Report.Lis' file. A menu of report titles is then output to the screen.

3. At the report menu level, enter the name of a report to generate, 'ALL' to generate all the reports listed, and 'EXIT' to terminate the report generator. The menu

responses can be upper and/or lower case. The following list briefly describes each DPNS report.

- EXECUTION: Shows the processor execution time with respect to each workload job that runs on the processor.
- UTILIZATION: Shows utilization of each processor without explicit reference to the jobs.
- EXEC_QUEUE: Shows queuing statistics for each processor.
- JOB_STORE: Shows, on a per processor basis, the number of jobs, etc. that were loaded onto the processor in batch mode ('b') and system mode ('s'). Note: batch mode jobs are not simulated.
- BATCH_JOB_STORE: Since no batch mode jobs are simulated in DPNS, this report can be ignored.
- TRANSMISSION_PATH: For each transmission device, a path is established between the transmitting device and receiving device. This report shows statistics for each transmission path. The path names correspond with the names of their respective transmission devices.
- TRANSMISSION_PATH_QUEUE: This report shows message queuing statistics for the transmission paths.
- TRANSMISSION_REPORT: Shows statistics on the transmission devices.
- CRITICAL_DEVICE_TRANS_QUEUE: Reports on critical transmission devices. A device becomes critical when a request is made for it and the device is not available. The request is queued and fulfilled when the device becomes free.
- TRANSMISSION_RATE: Shows transmission statistics for the network busses and internetwork links. Note that the word 'Message' in the report refers to 1 byte of data and not a network message of multiple bytes.

- JOB_REPORT: A job report is given for each workload job. A Job is a process that simulates execution on a CPU. Some jobs are spawned several times during the simulation period. Each job spawned is called an 'Instance' of that job. The job reports give averages over the total number of instances spawned during simulation time. Jobs include the foreground and background Payload workload and database transaction workload.
- EXTERNAL_PROCESS: An external process report is given for each external process. These processes do not simulate execution on a CPU. Several instances of the same external process can be spawned during a simulation period. The reports show averages over the total number of instances of a process. External processes are used to perform device transmissions, including mass storage transmissions and instrument, displays, etc.

4. After execution of the report generator, the reports will reside in the file 'Report.Lis'. The reports are 132 columns wide so should be output to a printer that accommodates 132 columns.

# Appendix A

# SimControl.Dat Sample File

1000

2

# Appendix B

# SSPayload.Dat Sample File

```
0.0 Y 200 1.0
SS.PAYLOAD 10000000 0
SS.PAYLOAD CONTROL.UTILITIES  8000000 SS.PAYLOAD.UTILITIES.STATUS  SS.PAYLOAD.UTILITIES.SENSORS 1700
SS.PAYLOAD CONTROL.UTILITIES  8000000 TIME  REAL.TIME.CLOCK  4
SS.PAYLOAD CONTROL.UTILITIES  8000000 SS.PAYLOAD.UTIL.DIRECTIVES  SSDS 1700
SS.PAYLOAD CONTROL.UTILITIES  8000000 SS.PAYLOAD.UTIL.DIRECTIVES  CUSTOMER.MMI 1700
SS.PAYLOAD CONTROL.UTILITIES  8000000 SS.PAYLOAD.UTILS.CMDS  DISPLAY  1700
SS.PAYLOAD CONTROL.UTILITIES  8000000 SS.PAYLOAD.UTILS.CMDS  RECORDER 1700
SS.PAYLOAD CONTROL.UTILITIES  8000000 SS.PAYLOAD.UTILS.CMDS  SSDS.DB1 1700
SS.PAYLOAD INITIALIZE  20000000 SS.PAYLOAD.INIT.DIR  SSDS.DB1 16000
SS.PAYLOAD INITIALIZE  20000000 SS.PAYLOAD.INIT.DIR  CUSTOMER.TAPE 16000
SS.PAYLOAD INITIALIZE  20000000 SS.PAYLOAD.INIT.DIR  CUSTOMER.MMI  16000
SS.PAYLOAD INITIALIZE  20000000 SS.INIT.STATUS  SSDS.DB2  16000
SS.PAYLOAD INITIALIZE  20000000 SS.INIT.STATUS  CUSTOMER.MMI  16000
SS.PAYLOAD INITIALIZE  20000000 SS.PAYLOAD.INIT.CMDS  SS.PAYLOAD  16000
SS.PAYLOAD CHECKOUT  20000000 PAYLOAD.I.T.DIR  SSDS.DB1  500000
SS.PAYLOAD CHECKOUT  20000000 PAYLOAD.I.T.DIR  CUSTOMER.MMI  500000
SS.PAYLOAD CHECKOUT  20000000 PAYLOAD.I.T.STATUS  PAYLOAD.TEST.UNIT  500000
SS.PAYLOAD CHECKOUT  20000000 TIME  REAL.TIME.CLOCK 4
SS.PAYLOAD CHECKOUT  20000000 PAYLOAD.I.T.CMDS  PAYLOAD.TEST.UNIT  500000
SS.PAYLOAD CHECKOUT  20000000 PAYLOAD.I.T.STATUS  SSDS.DB2  500000
SS.PAYLOAD CHECKOUT  20000000 PAYLOAD.I.T.STATUS  CUSTOMER.MMI  500000
SS.PAYLOAD OPERATE  10000000  0
SS.PAYLOAD POINT  40000000 SS.PAYLOAD.ATTITUDE  SSDS.DB1  5000
SS.PAYLOAD POINT  40000000 SS.PAYLOAD.STATE.VECTOR  SSDS.DB2  5000
SS.PAYLOAD POINT  40000000 TIME  REAL.TIME.CLOCK  4
SS.PAYLOAD POINT  40000000 SS.PAYLOAD.POINT.CMDS  SS.PAYLOAD.PLATFORM  3333
SS.PAYLOAD POINT  40000000 SS.PAYLOAD.POINT.STATUS  SSDS.DB1 3333
```

```
SS.PAYLOAD POINT  40000000 SS.PAYLOAD.POINT.STATUS  DISPLAY  3333
SS.PAYLOAD MAINTAIN  60000000 PAYLOAD.MONITORING.STATUS  PAYLOAD.MONITORING.SENSORS  1700
SS.PAYLOAD MAINTAIN  60000000 PAYLOAD.CHECKOUT.DIR  SSDS.DB2  1700
SS.PAYLOAD MAINTAIN  60000000 PAYLOAD.CHECKOUT.DIR  CUSTOMER.MMI  1700
SS.PAYLOAD MAINTAIN  60000000 TIME  REAL.TIME.CLOCK  4
SS.PAYLOAD MAINTAIN  60000000 PAYLOAD.MAINT.CMDS  PAYLOAD.CHECK.UNIT  1700
SS.PAYLOAD MAINTAIN  60000000 PAYLOAD.MAINT.STATUS  SSDS.DB1  1700
SS.PAYLOAD MAINTAIN  60000000 PAYLOAD.MAINT.STATUS  CUSTOMER.MMI  1700
SS.PAYLOAD ROTATE.SS.PORT  90000000 SS.PAYLOAD.ATTITUDE.STATUS  SENSORS  3333
SS.PAYLOAD ROTATE.SS.PORT  90000000 TIME  REAL.TIME.CLOCK  4
SS.PAYLOAD ROTATE.SS.PORT  90000000 ROTATE.SS.PORT.DIR  SSDS  3333
SS.PAYLOAD ROTATE.SS.PORT  90000000 ROTATE.SS.PORT.DIR  CUSTOMER.MMI  3333
SS.PAYLOAD ROTATE.SS.PORT  90000000 ROTATE.SS.PORT.CMDS  SS.PORT.ROT.UNIT  3333
SS.PAYLOAD ROTATE.SS.PORT  90000000 SS.PAYLOAD.POINT.STATUS  DISPLAY 3333
SS.PAYLOAD ROTATE.SS.PORT  90000000 SS.PAYLOAD.POINT.STATUS  SSDS.DB2  3333
SS.PAYLOAD USE.UTILITIES  10000000  0
SS.PAYLOAD PERFORM.EXPERIMENT  10000000  0
```

# Appendix C

# SystemDefn.Dat Sample File

```
2
3 2 2 2
3 1 3 1

8 1024 TTR
8 1024 TTR

100000000 100000000
100000000 100000000

1
1 2 9600 1000000

4
1 1
TAPE.DRIVE 2 2000000 2000000 30
DISK.DRIVE 3 4000000 4000000 10
PROCESSOR 1 2000000 2000000 0
DISPLAY 2 19000 19000 1
INSTRUMENT 1 2000000 2000000 0
CLOCK 1 100 100 0
SENSOR 3 5000 5000 0
VOICE 1 16000 16000 3
VIDEO 1 22000000 22000000 0
PRINTER 1 100 100 60

1 3
TAPE.DRIVE 4 2000000 2000000 30
```

```
DISK.DRIVE 5 4000000 4000000 10
PROCESSOR 1 2000000 2000000 0
DISPLAY 2 19000 19000 1
INSTRUMENT 6 2000000 2000000 0
CLOCK 1 100 100 0
SENSOR 3 5000 5000 0
VOICE 1 16000 16000 3
VIDEO 1 22000000 22000000 0
PRINTER 1 100 100 60

2 1
TAPE.DRIVE 1 2000000 2000000 30
DISK.DRIVE 1 4000000 4000000 10
PROCESSOR 1 2000000 2000000 0
DISPLAY 1 19000 19000 1
INSTRUMENT 1 2000000 2000000 0
CLOCK 1 100 100 0
SENSOR 1 5000 5000 0
VOICE 1 16000 16000 3
VIDEO 1 22000000 22000000 0
PRINTER 1 100 100 60

2 2
TAPE.DRIVE 1 2000000 2000000 30
DISK.DRIVE 1 4000000 4000000 10
PROCESSOR 2 2000000 2000000 0
DISPLAY 1 19000 19000 1
INSTRUMENT 1 2000000 2000000 0
CLOCK 1 100 100 0
SENSOR 1 5000 5000 0
VOICE 1 16000 16000 3
VIDEO 1 22000000 22000000 0
PRINTER 1 100 100 60

4
1 1 INGRES NONDISTRIBUTED 10 4
1 3 INGRES NONDISTRIBUTED 10 4
2 1 INGRES NONDISTRIBUTED 10 4
2 2 INGRES NONDISTRIBUTED 10 4

22
1 1 SS.PAYLOAD.UTILITIES.SENSORS SENSOR
1 1 REAL.TIME.CLOCK CLOCK
```

```
 1 1 SSDS INSTRUMENT
 2 2 CUSTOMER.MMI DISPLAY
 1 3 DISPLAY DISPLAY
 1 3 RECORDER VOICE
 1 3 CUSTOMER.TAPE TAPE.DRIVE
 1 3 SS.PAYLOAD INSTRUMENT
 2 1 PAYLOAD.TEST.UNIT INSTRUMENT
 2 1 SS.PAYLOAD.PLATFORM INSTRUMENT
 2 1 PAYLOAD.MONITORING.SENSORS SENSOR
 2 1 PAYLOAD.CHECK.UNIT INSTRUMENT
 2 2 SENSORS SENSOR
 2 2 SS.PORT.ROT.UNIT INSTRUMENT
 1 1 TAPE.DRIVE1 TAPE.DRIVE
 1 3 TAPE.DRIVE2 TAPE.DRIVE
 2 1 TAPE.DRIVE3 TAPE.DRIVE
 2 2 TAPE.DRIVE4 TAPE.DRIVE
 1 1 DISK.DRIVE1 DISK.DRIVE
 1 3 DISK.DRIVE2 DISK.DRIVE
 2 1 DISK.DRIVE3 DISK.DRIVE
 2 2 DISK.DRIVE4 DISK.DRIVE

 2
 2 2 SSDS.DB1 INGRES DISK.DRIVE DISK.DRIVE4 4
 1 1 SSDS.DB2 INGRES DISK.DRIVE DISK.DRIVE1 4

 10
 1 1 SS.PAYLOAD SS.PAYLOAD
 1 1 SS.PAYLOAD CONTROL.UTILITIES
 1 3 SS.PAYLOAD INITIALIZE
 1 3 SS.PAYLOAD CHECKOUT
 2 1 SS.PAYLOAD OPERATE
 2 1 SS.PAYLOAD POINT
 2 1 SS.PAYLOAD MAINTAIN
 2 2 SS.PAYLOAD ROTATE.SS.PORT
 2 2 SS.PAYLOAD USE.UTILITIES
 2 2 SS.PAYLOAD PERFORM.EXPERIMENT
```